The Role of Myrica Nagi Bark in Tumor Suppression and Bowel Regulation: A Review

[1]Mr Shaikh Mohammed Umair Rehan, [2]Mr Naseem Qureshi, [3]Miss Bushra hundekari
[1,2,3] *Aurangabad Pharmacy College*

Abstract: ***Myrica nagi*****, commonly known as bayberry, is a medicinal plant extensively used in traditional and folk medicine systems across Asia. Among the various parts of the plant, the bark has attracted increasing scientific attention due to its broad spectrum of pharmacological activities. Rich in bioactive compounds such as flavonoids, tannins, saponins, and phenolic acids, the bark of *Myrica nagi* demonstrates potent antioxidant, anti-inflammatory, antimicrobial, and anticancer properties. These constituents not only help combat oxidative stress but also modulate inflammatory pathways and inhibit microbial growth, thereby contributing to overall health.**

Recent preclinical studies suggest that *Myrica nagi* bark may have significant therapeutic potential in the prevention and management of cancer, particularly colorectal cancer. The antitumor effects are believed to stem from its ability to regulate cell proliferation, induce apoptosis in cancer cells, and inhibit angiogenesis and metastasis. Furthermore, the bark's role in promoting gastrointestinal health has been highlighted in various studies, where it has shown promising results in alleviating symptoms of irritable bowel syndrome (IBS) and other digestive disorders. Its potential to restore gut microbial balance and enhance bowel motility makes it a valuable candidate for further research in gastrointestinal therapeutics.

This review critically examines the phytochemical composition of *Myrica nagi* bark and its diverse pharmacological activities, with a specific focus on its implications for cancer prevention and gastrointestinal regulation. By consolidating current findings, the article aims to provide a comprehensive overview of how *Myrica nagi* bark may serve as a natural, plant-based intervention for tumor inhibition and bowel health improvement. The evidence presented here could pave the way for future clinical applications and drug development initiatives centered around this traditionally used yet scientifically underexplored botanical resource.

Keywords: **Myrica Nagi, tumor suppression, bowel regulation, bioactive compounds, flavonoids, tannins, alkaloids, cancer prevention, anti-inflammatory, antioxidant, medicinal plants, phytochemistry.**

1. INTRODUCTION

Myrica nagi, also known as the bayberry, is a small to medium-sized evergreen tree belonging to the family *Myricaceae*. Native to the tropical and subtropical regions of Asia, including India, Nepal, and parts of Southeast Asia, the plant has long been recognized in traditional medicine systems such as Ayurveda and traditional Chinese medicine for its wide range of therapeutic applications. Various parts of the plant—including the bark, leaves, fruits, and roots—have been traditionally employed to treat ailments such as respiratory infections, digestive disorders, wounds, and inflammatory conditions.

Among the different plant parts, the bark of *Myrica nagi* has recently garnered significant scientific interest due to its promising pharmacological properties. Traditionally used as an astringent and digestive aid, the bark is now being explored for its potential role in modern therapeutic interventions, particularly in oncology and gastroenterology. Emerging research has indicated that the bark contains a rich profile of bioactive phytochemicals, including flavonoids, triterpenoids, tannins, and phenolic compounds, which contribute to its antioxidant, anti-inflammatory, antimicrobial, and anticancer activities.

One of the most compelling areas of study revolves around the bark's ability to modulate tumor growth and enhance gastrointestinal health. Preclinical evidence suggests that compounds derived from *Myrica nagi* bark may inhibit cancer cell proliferation, induce apoptosis, and interfere with the molecular signaling pathways involved in tumor development. These antitumor effects have been particularly noted about colorectal cancer, a major global health concern. Additionally, the bark has demonstrated potential in regulating bowel

movements, supporting intestinal microbial balance, and reducing inflammation in the gut—factors that are critical in managing conditions such as irritable bowel syndrome (IBS) and inflammatory bowel diseases (IBDs).

Given the increasing burden of cancer and gastrointestinal disorders worldwide, there is a growing need to explore and validate natural plant-based alternatives that offer efficacy with minimal side effects. This review aims to provide a comprehensive overview of the phytoconstituents present in *Myrica nagi* bark and to critically evaluate their pharmacological roles, particularly in the context of tumor suppression and bowel regulation. By consolidating existing research, this article seeks to bridge the gap between traditional knowledge and modern scientific evidence, and to highlight the potential of *Myrica nagi* bark as a valuable resource in the development of novel therapeutic agents.

2. CHEMICAL COMPOSITION OF MYRICA NAGI BARK

The bark of *Myrica nagi* is a reservoir of diverse bioactive phytochemicals that are primarily responsible for its therapeutic efficacy. A growing body of phytochemical and pharmacological research has revealed the presence of multiple classes of compounds, including flavonoids, tannins, phenolic acids, alkaloids, and terpenoids. These naturally occurring molecules work synergistically to exert various biological effects such as antioxidant, anti-inflammatory, antimicrobial, and anticancer activities. Understanding the chemical makeup of *Myrica nagi* bark is essential to elucidate its mechanisms of action and therapeutic potential, particularly concerning tumor suppression and gastrointestinal health.

The major constituents of *Myrica nagi* bark include:

- Flavonoids: These polyphenolic compounds are among the most studied constituents due to their powerful antioxidant capabilities. Flavonoids such as quercetin, myricetin, and kaempferol help neutralize free radicals, thereby protecting cellular components from oxidative stress, a key factor in carcinogenesis and chronic inflammation. Additionally, flavonoids are known to modulate various cellular signaling pathways involved in immune response and apoptosis, making them crucial agents in cancer prevention and immunomodulation.
- Tannins: Tannins are astringent polyphenols that contribute to the bark's anti-inflammatory and antimicrobial properties. They inhibit the growth of pathogenic microorganisms by disrupting microbial membranes and protein structures. Furthermore, their ability to reduce inflammation makes them valuable in the treatment of gastrointestinal disorders, where inflammation plays a central role.
- Phenolic Compounds: This broad class of compounds includes phenolic acids such as gallic acid and ferulic acid, which are potent antioxidants. These compounds scavenge reactive oxygen species (ROS), reduce oxidative damage to DNA and cellular membranes, and are implicated in the suppression of tumor initiation and progression. Their presence in *Myrica nagi* bark enhances its potential for preventing oxidative stress-related diseases, including cancer and neurodegenerative conditions.
- Alkaloids: Though less abundant than other phytochemicals, alkaloids in *Myrica nagi* bark have been explored for their cytotoxic effects on cancer cells. These nitrogen-containing compounds can interfere with DNA synthesis and disrupt cellular division in malignant cells. Some studies have reported their role in inhibiting angiogenesis and metastasis, which are crucial in cancer progression.
- Terpenoids: These lipid-soluble compounds, including monoterpenes and triterpenes, are known for their wide-ranging pharmacological activities. In the context of oncology, terpenoids exhibit antineoplastic properties by suppressing tumor cell proliferation, inducing programmed cell death (apoptosis), and modulating inflammatory pathways. Their role in chemoprevention is gaining recognition in contemporary cancer research.

3. TUMOR SUPPRESSION BY MYRICA NAGI BARK

The potential antitumor activity of *Myrica nagi* bark has become a focal point in phytopharmacological research. Multiple preclinical studies have investigated the biochemical and molecular pathways through which the bark's bioactive compounds exert anticancer effects. These mechanisms collectively interfere with key processes involved in tumor initiation, progression, and metastasis. Below are the principal modes of action through which *Myrica nagi* bark may suppress tumor growth:

- Antioxidant Activity:

Oxidative stress, characterized by an overproduction of reactive oxygen species (ROS), plays a central role

in DNA damage, mutation accumulation, and the initiation of carcinogenesis. *Myrica nagi* bark contains a rich concentration of flavonoids (e.g., quercetin and myricetin) and phenolic acids (e.g., gallic acid), which have potent antioxidant properties. These compounds neutralize free radicals, stabilize cellular structures, and protect nuclear DNA from oxidative damage. By mitigating oxidative stress, *Myrica nagi* bark helps maintain genomic integrity and reduces the risk of tumor development.

- Induction of Apoptosis:

One of the hallmark mechanisms by which *Myrica nagi* bark exerts antitumor effects is through the induction of apoptosis, or programmed cell death, specifically in cancer cells. Compounds such as terpenoids and alkaloids found in the bark can activate intrinsic and extrinsic apoptotic pathways. They do so by upregulating pro-apoptotic proteins (e.g., Bax, caspases) and downregulating anti-apoptotic markers (e.g., Bcl-2), leading to mitochondrial dysfunction and cell death. This selective cytotoxicity toward cancer cells is crucial in preventing their uncontrolled proliferation.

- Anti-inflammatory Effects:

Chronic inflammation is a well-established contributor to the tumor microenvironment, facilitating cancer cell survival, invasion, and immune evasion. *Myrica nagi* bark exhibits strong anti-inflammatory properties by inhibiting the production of pro-inflammatory cytokines such as TNF-α, IL-6, and IL-1β. Additionally, it modulates inflammatory signaling pathways such as NF-κB and COX-2, which are frequently activated in various cancers. By attenuating inflammatory responses, the bark reduces the risk of tumor initiation and progression.

- Inhibition of Angiogenesis:

For tumors to grow beyond a certain size, they must develop their own blood supply through angiogenesis. *Myrica nagi* bark contains bioactive compounds that have been shown to inhibit angiogenic signaling pathways, such as VEGF (vascular endothelial growth factor). This inhibition prevents the formation of new blood vessels that would otherwise supply oxygen and nutrients to the tumor. By starving the tumor of its vascular support, *Myrica nagi* bark effectively limits tumor expansion and metastatic potential.

4. MYRICA NAGI BARK AND BOWEL REGULATION

In addition to its tumor-suppressive properties, *Myrica nagi* bark has demonstrated potential benefits in maintaining and restoring gastrointestinal health, particularly in the management of disorders such as irritable bowel syndrome (IBS), inflammatory bowel disease (IBD), and constipation. These effects can be attributed to a combination of anti-inflammatory, antimicrobial, and gut-modulating properties. The key mechanisms include:

- Anti-inflammatory Properties:

Myrica nagi bark exhibits notable anti-inflammatory effects that can help soothe inflamed intestinal tissues. This is particularly beneficial for conditions like IBS and IBD, where chronic inflammation contributes to symptoms such as abdominal pain, cramping, and diarrhea.

- Antimicrobial Activity:

The bark contains bioactive compounds with broad-spectrum antimicrobial properties, which can help regulate the gut microbiota. By controlling the overgrowth of pathogenic bacteria, it supports a healthy microbial balance essential for optimal digestive function and immune response.

- Regulation of Digestive Enzymes:

Some constituents of *Myrica nagi* bark may influence the secretion and activity of key digestive enzymes, enhancing nutrient breakdown and absorption. Improved enzyme function can lead to better digestion and reduced gastrointestinal discomfort.

- Laxative Effects:

Certain phytochemicals present in the bark exhibit mild laxative properties, promoting regular bowel movements. This makes *Myrica nagi* particularly useful in managing constipation, especially when associated with IBS or dietary factors.

5. EVIDENCE FROM CLINICAL STUDIES

Several studies have explored the effects of Myrica Nagi bark on tumor suppression and bowel regulation. Some of the findings include:

Although much of the therapeutic potential of *Myrica nagi* bark has been established through in vitro assays and animal model studies, an increasing number of preclinical and early-stage clinical investigations are beginning to validate its use in humans. These studies highlight the bark's effectiveness in tumor suppression and gastrointestinal regulation, providing a foundation for future clinical applications. Below are key findings from recent research:

- Tumorigenesis Inhibition:

In vivo studies using animal models have demonstrated that *Myrica nagi* bark extract can significantly inhibit tumor growth. These effects are attributed to its rich content of flavonoids, terpenoids, and alkaloids, which can interfere with cancer cell proliferation, induce apoptosis, and suppress angiogenesis. In one such study, rodents treated with bark extracts showed a reduction in tumor volume and cell viability in induced colorectal cancer models. Although these findings are promising, robust clinical trials in human subjects are still required to confirm efficacy and establish safety profiles for long-term use in oncology.

- Gut Health Improvement:

Preliminary clinical trials and ethnopharmacological surveys have shown that *Myrica nagi* bark extracts may help manage symptoms associated with irritable bowel syndrome (IBS) and related gastrointestinal disorders. Patients receiving bark-based formulations reported reduced bloating, abdominal cramping, and episodes of diarrhea. These effects are believed to result from the bark's anti-inflammatory, astringent, and antimicrobial properties, which support intestinal mucosal integrity, regulate gut motility, and balance the gut microbiota. These findings position *Myrica nagi* as a potential adjunctive or alternative treatment for chronic gastrointestinal conditions.

- Synergistic Effects with Other Natural Compounds:

One of the more recent developments in *Myrica nagi* research is its observed synergistic activity when combined with other phytotherapeutic agents. For example, co-administration with turmeric (curcumin) or ginger (gingerol) has been found to enhance the overall anti-inflammatory and antitumor effects. These combinations amplify antioxidant activity, modulate multiple signaling pathways (such as NF-κB and MAPK), and may offer multi-targeted approaches to complex conditions like cancer and IBS. Such synergism could reduce required dosages and minimize potential side effects, making combined formulations an area of considerable interest for future pharmaceutical development.

- Synergistic Effects with Other Natural Compounds:
- One of the more recent developments in Myrica nagi research is its observed synergistic activity when combined with other phytotherapeutic agents. For example, co-administration with turmeric (curcumin) or ginger (gingerol) has been found to enhance the overall anti-inflammatory and antitumor effects. These combinations amplify antioxidant activity, modulate multiple signaling pathways (such as NF-κB and MAPK), and may offer multi-targeted approaches to complex conditions like cancer and IBS. Such synergism could reduce required dosages and minimize potential side effects, making combined formulations an area of considerable interest for future pharmaceutical development.

6. FUTURE PERSPECTIVES

Although early research and traditional knowledge support the medicinal benefits of *Myrica nagi* bark, its therapeutic application in modern medicine remains in a nascent stage. Current evidence, primarily derived from in vitro experiments, animal models, and preliminary clinical observations, is promising yet insufficient for routine clinical use. Therefore, a comprehensive research framework is required to validate its pharmacological potential, understand its mechanisms more thoroughly, and ensure its safety in human populations. The following directions are pivotal for advancing the scientific understanding and application of *Myrica nagi* bark:

Area of Research	Key Considerations	Study Design Suggestions
Tumor Suppression	Evaluating efficacy in cancers (e.g., colorectal, gastric, liver)	Randomized controlled trials (RCTs), cohort studies, biomarker-based endpoints
Gastrointestinal Disorders	Investigating effects on IBS, IBD, and other bowel health issues	RCTs with appropriate control groups, symptom assessment scales, long-term follow-up
Diverse Patient Populations	Ensuring inclusivity across various age groups, ethnicities, and disease stages	Stratified sampling, subgroup analysis
Control Groups	Use of placebo or standard care comparators to evaluate treatment efficacy and safety	Parallel group designs, cross-over designs for comparing multiple treatments
Long-term Follow-up	Monitoring for delayed therapeutic effects and potential toxicity	Longitudinal studies, safety assessments over extended periods (e.g., 6 months - 1 year)

Biomarker-based Endpoints	Measuring inflammation, oxidative stress markers, tumor markers, gut microbiota composition, and enzyme activity	Biomarker collection pre- and post-treatment, use of imaging studies like CT/MRI for tumor evaluation
Mechanistic Insights	Understanding the molecular action of bioactive compounds in clinical settings	Genetic expression studies, proteomic analysis, pathway-focused research
Synergistic Effects	Investigating combinations with other plant-based or pharmaceutical treatments	Combination therapy trials, interaction studies with drugs like chemotherapy or immune modulators

- Pharmacokinetics and Toxicity Studies:

One of the major limitations in the clinical translation of plant-based therapies is the lack of pharmacokinetic and toxicological data. Future research should focus on investigating the absorption, bioavailability, metabolism, and elimination of the bioactive compounds in *Myrica nagi* bark. Studies should also assess both acute and chronic toxicity in various biological systems to determine the therapeutic index, maximum tolerated doses, and potential drug-herb interactions. Such data will be crucial for developing standardized formulations with predictable pharmacological effects.

- Human Clinical Trials:

To move beyond theoretical and experimental promise, *Myrica nagi* bark must be evaluated in rigorously designed clinical trials. Randomized controlled trials (RCTs) assessing its efficacy in tumor suppression (e.g., in colorectal or gastric cancer) and gastrointestinal disorders (e.g., IBS or IBD) are essential. These studies should include a diverse patient population, appropriate control groups, and long-term follow-up to assess both efficacy and safety. Biomarker-based endpoints and imaging studies may also be employed to better understand the plant's mechanism of action in clinical settings.

To translate the promising pharmacological effects of *Myrica nagi* bark from laboratory findings to real-world therapeutic applications, rigorously designed human clinical trials are indispensable. While preclinical studies have laid a strong foundation, evidence from randomized controlled trials (RCTs) is crucial for validating its safety and efficacy in clinical settings.

Future trials should aim to evaluate *Myrica nagi* bark's potential in tumor suppression, particularly in cancers such as colorectal, gastric, or hepatic carcinoma, where inflammation and oxidative stress play pivotal roles in disease progression. Parallel investigations into its effectiveness in managing gastrointestinal disorders, such as irritable bowel syndrome (IBS) and inflammatory bowel disease (IBD)—should also be prioritized.

Key design considerations for these trials should include:

- Diverse Patient Populations: Enrolling individuals across different age groups, ethnicities, and disease stages to ensure the generalizability of the results.
- Appropriate Control Groups: Utilizing placebo or standard-of-care comparators to accurately assess treatment outcomes.
- Long-term Follow-up: Monitoring for delayed effects or potential toxicity, especially given the chronic nature of many of the target diseases.
- Mechanistic Insights: Incorporating biomarker-based endpoints, such as inflammatory cytokines, oxidative stress markers, or tumor markers, alongside advanced imaging techniques, could help elucidate *Myrica nagi* bark's mode of action at the molecular level.
- Combination Therapy and Synergistic Potential: Natural compounds often exhibit enhanced therapeutic efficacy when used in synergy with other agents. Future studies should explore the co-administration of *Myrica nagi* bark with other phytochemicals, such as curcumin, gingerol, or resveratrol—or even with standard chemotherapeutic drugs. This approach may enhance antitumor and gastrointestinal protective effects while reducing the required dosages and side effects of conventional therapies. Mechanistic studies focusing on pathway modulation (e.g., NF-κB, PI3K/Akt, VEGF) could help identify synergistic targets for more effective combination therapies.

7. CONCLUSION

Myrica nagi bark stands out as a compelling natural remedy with multifaceted therapeutic potential,

particularly in the areas of tumor suppression and bowel regulation. Rich in a diverse array of bioactive compounds—including flavonoids, tannins, phenolic acids, alkaloids, and terpenoids—this botanical source demonstrates robust antioxidant, anti-inflammatory, and antimicrobial properties.

These properties not only help mitigate oxidative stress and inflammation, two key contributors to tumor development, but also support a healthier gastrointestinal environment by promoting microbial balance, enzyme regulation, and regular bowel function. The observed ability of *Myrica nagi* bark to induce apoptosis, inhibit angiogenesis, and modulate gut health mechanisms makes it a candidate of great interest in preventive oncology and functional gastrointestinal disorders such as IBS and IBD.

Despite the encouraging data from in vitro and animal studies, comprehensive clinical trials are essential to validate these findings in human populations. Furthermore, investigations into its pharmacokinetics, toxicity profile, and synergistic potential with other natural or conventional therapies could accelerate its integration into mainstream medical practice.

In conclusion, the therapeutic versatility of *Myrica nagi* bark holds promise for its future use as a complementary or alternative therapeutic agent in cancer prevention and gastrointestinal health management. Continued research in this area may pave the way for its inclusion in modern pharmacological strategies, contributing to safer, plant-based interventions for complex health conditions.

8. REFERENCES

[1] Sharma, S., & Singh, S. (2020). "Phytochemical analysis and pharmacological properties of Myrica Nagi: A review." *Journal of Herbal Medicine*, 12(2), 112-118.

[2] Gupta, R., & Srivastava, P. (2019). "Anticancer potential of Myrica Nagi bark: A pharmacological review." *Cancer Research Journal*, 8(5), 223-229.

[3] Khan, M., et al. (2018). "Role of Myrica Nagi bark in gastrointestinal health: A review." *International Journal of Pharmacology*, 14(3), 150-157.

[4] Verma, R., & Patel, S. (2021). "Myrica Nagi bark and its role in tumor inhibition and bowel regulation." *Phytomedicine Reviews*, 6(1), 45-53.

[5] Sharma, A., et al. (2022). "Evaluation of Myrica Nagi for the management of irritable bowel syndrome and colorectal cancer." *Clinical Oncology*, 11(4), 78-85.

[6] Singh, R., & Singh, B. (2010). Myrica nagi: A review on its traditional uses, phytochemistry and pharmacological activities. *Journal of Ethnopharmacology*, 128(2), 357–364.

[7] Thakur, A. K., & Shukla, S. K. (2009). A pharmacognostical study of Myrica nagi. *Indian Journal of Natural Products and Resources*, 8(4), 302–306.

[8] Tripathi, Y. B., & Sharma, M. (2005). Antioxidant activity of Myrica nagi bark extract. *Indian Journal of Biochemistry & Biophysics*, 42(5), 292–295.

[9] Baliga, M. S., et al. (2011). Phytochemistry, traditional uses and pharmacology of Myrica species. *Phytotherapy Research*, 25(10), 1421–1431.

[10] Joshi, A. R., & Joshi, K. (2000). Indigenous knowledge and uses of medicinal plants by local communities in the Himalayas. *Journal of Ethnopharmacology*, 73(1-2), 63–71.

[11] Upadhyay, A. K., et al. (2012). Pharmacological activities of medicinal plants of Myricaceae family. *Asian Pacific Journal of Tropical Biomedicine*, 2(3), S1121–S1124.

[12] Prasad, S., & Aggarwal, B. B. (2011). Turmeric, the golden spice: From traditional medicine to modern medicine. *Herbal Medicine: Biomolecular and Clinical Aspects*, 2nd ed. CRC Press.

[13] Grover, J. K., et al. (2002). Medicinal plants used in treatment of diabetes mellitus. *Indian Journal of Clinical Biochemistry*, 17(2), 45–50.

[14] Lee, J. H., et al. (2012). Antioxidant and anti-inflammatory properties of terpenoids. *Molecules*, 17(1), 1040–1060.

[15] Ghosh, R., & Ghosh, B. (2010). Anti-inflammatory and antitumor properties of herbal constituents. *Journal of Herbal Medicine*, 10(2), 97–104.

[16] Lobo, V., et al. (2010). Free radicals, antioxidants and functional foods: Impact on human health. *Pharmacognosy Reviews*, 4(8), 118–126.

[17] Patel, D. N., et al. (2013). Antimicrobial activity of Myrica nagi bark. *International Journal of Pharmaceutical Sciences Review and Research*, 21(2), 157–160.

[18] Agarwal, A., et al. (2005). Apoptosis and its regulation by natural compounds. *Cancer Letters*, 219(1), 1–20.

[19] Khan, M. T. H., et al. (2009). Biological screening of selected medicinal plants. *Bangladesh Journal of Pharmacology*, 4(1), 31–35.

[20] Duraipandiyan, V., & Ignacimuthu, S. (2007). Antibacterial and antifungal activity of Myrica nagi bark. *Journal of Medicinal Plants Research*, 1(4), 065–069.

[21] Ogbourne, S. M., & Suhrbier, A. (2010). Antitumor properties of plant-derived terpenoids. *Cancer Treatment Reviews*, 36(7), 559–568.

[22] Kumar, V., & Yadav, S. K. (2012). Antidiarrheal activity of Myrica nagi bark. *Journal of Ethnopharmacology*, 140(3), 569–573.

[23] Williamson, E. M. (2002). Major herbs of Ayurveda. *Churchill Livingstone*, UK.

[24] Paul, J., & Kapoor, N. (2015). Anti-IBS activity of selected herbal formulations. *Asian Journal of Pharmaceutical and Clinical Research*, 8(5), 134–137.

[25] Singh, B., et al. (2011). Antiulcerogenic activity of Myrica nagi bark extract. *Indian Journal of Pharmacology*, 43(3), 298–302.

[26] Chatterjee, A., & Pakrashi, S. C. (1994). The Treatise on Indian Medicinal Plants, Volume 3. *Publications & Information Directorate, CSIR*, New Delhi.

[27] Subramanian, R., et al. (2013). Hepatoprotective and antioxidant activity of Myrica nagi. *Pharmacognosy Journal*, 5(6), 215–219.

[28] Gupta, M., et al. (2005). Evaluation of wound healing activity of bark extract of Myrica nagi. *Indian Journal of Experimental Biology*, 43(6), 522–525.

[29] Liu, R. H. (2003). Health benefits of fruit and vegetables: Role of antioxidant properties. *American Society for Nutritional Sciences*, 133(11), 3479S–3485S.

[30] Goyal, R. K., & Singh, J. (2006). Comparative antioxidant activity of herbal drugs. *Pharmaceutical Biology*, 44(6), 470–475.

[31] Tiwari, A. K., & Madhusudana Rao, J. (2002). Diabetes mellitus and multiple therapeutic approaches of phytochemicals. *Current Science*, 83(1), 30–38.

[32] Ahmad, F., et al. (2010). Traditional uses and pharmacological properties of Myrica nagi. *International Journal of Drug Development and Research*, 2(2), 287–294.

[33] Kamboj, A., & Saluja, A. K. (2011). Medicinal plants with potential anticancer activity: A review. *International Journal of Green Pharmacy*, 5(4), 164–169.

[34] Singh, D., & Chander, V. (2015). Role of natural agents in chemoprevention. *Journal of Pharmacognosy and Phytochemistry*, 4(1), 80–88.

[35] Sharma, V., & Thakur, M. (2016). Phytochemical and therapeutic overview of Myrica species. *World Journal of Pharmaceutical Sciences*, 4(9), 129–138.

[36] Gupta, R., & Sharma, A. K. (2013). Herbal medicine for gastrointestinal diseases. *International Journal of Pharmaceutical Sciences and Research*, 4(10), 3693–3700.

[37] Khan, S., et al. (2020). Gut microbiota modulation by plant polyphenols: New opportunities. *Critical Reviews in Food Science and Nutrition*, 60(11), 1835–1851.

[38] Bhattacharya, S. (2011). Phytopharmacology of anti-inflammatory plants. *Journal of Medicinal Plants Studies*, 1(2), 9–16.

[39] Kapoor, L. D. (2001). CRC Handbook of Ayurvedic Medicinal Plants. *CRC Press*, Florida.

[40] Chen, A. Y., & Chen, Y. C. (2013). A review of the dietary flavonoid, kaempferol on human health. *Food Chemistry*, 138(4), 2099–2107.